

**MOBILE COMMUNICATION – 3G AND ABOVE  
(ECEN 4247)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and  
any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

**Group – A  
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The use of directional antennas at the cell-site will result into
    - (a) reduction in co channel interference and increase in system capacity
    - (b) reduction in co channel interference as well as system capacity
    - (c) increase in co channel interference as well as system capacity
    - (d) increase in co channel interference and increase in system capacity.
  - (ii) For a given frequency reuse ratio of 8 and the cell radius of 0.8 km, the distance between the nearest co channel cells is
    - (a) 6.4 km      (b) 0.8 km      (c) 0.1 km      (d) 8.8 km.
  - (iii) Which of the following problem occur due to adjacent channel interference?
    - (a) Cross talk      (b) Missed calls      (c) Blocked calls      (d) Near-far effect.
  - (iv) Popular 2G CDMA standard IS-95 is also known as \_\_\_\_\_.
    - (a) CDMA One      (b) CDMA Two      (c) IS-136      (d) IS-95B
  - (v) What does SGSN stands for?
    - (a) Serving GPRS Support Node
    - (b) Supporting GGSN Support Node
    - (c) Supporting GPRS Support Node
    - (d) Supporting Gateway Support Node.
  - (vi) Which one is not an advantage of using frequency reuse?
    - (a) Increased capacity
    - (b) Limited spectrum
    - (c) Reallocation of same spectrum
    - (d) Reduction in number of base stations.
  - (vii) What is the chip rate of W-CDMA?
    - (a) 1.2288 Mcps      (b) 3.84 Mcps      (c) 270.833 Ksps      (d) 100 Mcps.

- (viii) GPRS stands for \_\_\_\_\_.  
(a) General Packet Radio Service (b) Geo Packet Radio Service  
(c) Gradient Packet Radio Service (d) none of the above
- (ix) UMTS use which multiple access technique?  
(a) CDMA (b) TDMA  
(c) FDMA (d) SDMA.
- (x) OFDMA stands for \_\_\_\_\_.  
(a) Omnidirectional frequency division multiple access  
(b) Orthogonal frequency duplex multiple access  
(c) Orthogonal frequency divider multiple access  
(d) Orthogonal frequency division multiple access.

### **Group - B**

2. (a) Decide the optimum cell shape for mobile communication from the common regular geometrical shapes. [(CO1, CO2)(Evaluate/HOCQ)]  
(b) What is a cluster? With a proper diagram explain the frequency reuse concept in the cellular system. [(CO1, CO2)(Understand/LOCQ)]  
(c) Check the relationship between the cluster size and capacity of a cellular system. [(CO1, CO2)(Evaluate/HOCQ)]  
**3 + (2 + 3) + 4 = 12**
3. (a) Explain the hand-off process with a suitable diagram. [(CO1, CO2)(Understand/LOCQ)]  
(b) Propose an approach to optimally handle the hand-off process in the case of both fast and slow-moving users? [(CO1, CO2)(Evaluate/HOCQ)]  
(c) Compare hard handoff and soft hand off. [(CO1, CO2)(Analyse/IOCQ)]  
**3 + 6 + 3 = 12**

### **Group - C**

4. (a) What is UTRAN in the UMTS network? Correlate its role in UMTS operation. [(CO3, CO6)(Understand/LOCQ)][(CO3, CO6)(Apply/IOCQ)]  
(b) What do you mean by logical Channels? Mention different control channels in the UMTS network. [(CO3)(Remember/LOCQ)]  
**(2 + 5) + (2 + 3) = 12**
5. (a) Comparing the basic features of IS-95 and CDMA2000, summarize the advancements in CDMA2000. [(CO3, CO6)(Evaluate/HOCQ)]  
(b) Identify the three key elements in cdma2000 1X EV-DO (HDR) network and mention briefly their role in the network. [(CO3)(Analyse/IOCQ)]  
**6 + (3 + 3) = 12**

**Group - D**

6. (a) How OFDM improves the performance of 4G LTE System? [(CO4, CO6)(Analysis/IOCQ)]  
 (b) Mention the key features of a 4G network . [(CO4)(Understand/LOCQ)]  
**8 + 4 = 12**
7. (a) Explain the term BLAST. [(CO4)(Analysis/IOCQ)]  
 (b) How the channel bandwidth in LTE is shared by active users? [(CO4)(Understand/LOCQ)]  
**6 + 6 = 12**

**Group - E**

8. (a) Identify the modifications made in the LTE-Advanced system to achieve higher peak rates, higher throughput and coverage in comparison to the existing LTE Release 8 coverage? [(CO5, CO6)(Evaluate/HOCQ)]  
 (b) Mention the new functionalities which are introduced in LTE-Advanced. [(CO5)(Remember/LOCQ)]  
**8 + 4 = 12**
9. (a) Explain how the carrier aggregation leads towards bandwidth enhancement in the LTE-Advanced system. [(CO5)(Analysis/IOCQ)]  
 (b) NOMA scheme efficiently exploits the channel gain difference between users to achieve high spectral efficiency: Justify the statement? [(CO5)(Analysis/IOCQ)]  
**6 + 6 = 12**

| Cognition Level         | LOCQ  | IOCQ  | HOCQ  |
|-------------------------|-------|-------|-------|
| Percentage distribution | 30.21 | 41.67 | 28.13 |

**Course Outcome (CO):**

After the completion of the course students will be able to

1. Recapitulate cellular communication systems, architecture, functioning, and various standards.
2. Learn evolution of mobile communication generations 2G, 2.5G
3. Learn 3G with their characteristics and limitations.
4. Understand emerging technologies required for fourth generation mobile systems such as SDR, MIMO etc.
5. Understand the concept of LTE-advanced, 4G features and challenges, 5G vision.
6. Analyse and compare architecture, functioning, protocols, capabilities and application of various mobile communication networks.

\*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

